

ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:
Climate Prediction Center / NCEP
27 March 2017

Outline

Summary

Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

Pacific SST Outlook

U.S. Seasonal Precipitation and Temperature Outlooks

Summary

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ENSO Alert System Status: Not Active

ENSO-neutral conditions are present.*

Equatorial sea surface temperatures (SSTs) are near-average across the central and east-central Pacific. They are above-average in the eastern Pacific Ocean.

ENSO-neutral conditions are favored to continue through at least the Northern Hemisphere spring 2017, with increasing chances for El Niño development into the fall.*

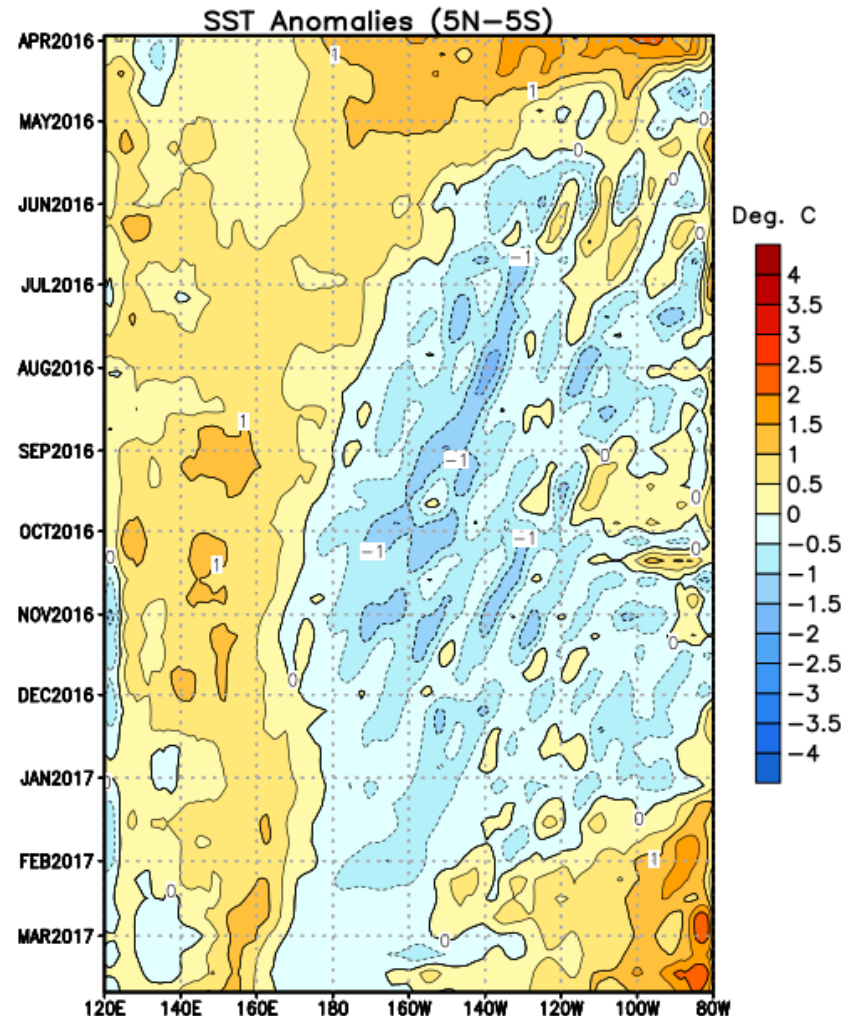
* Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).

Recent Evolution of Equatorial Pacific SST Departures (°C)

From July through December 2016, below average SSTs were observed over most of the central and eastern Pacific Ocean.

During January and February 2017, above-average SSTs expanded within the eastern Pacific Ocean.

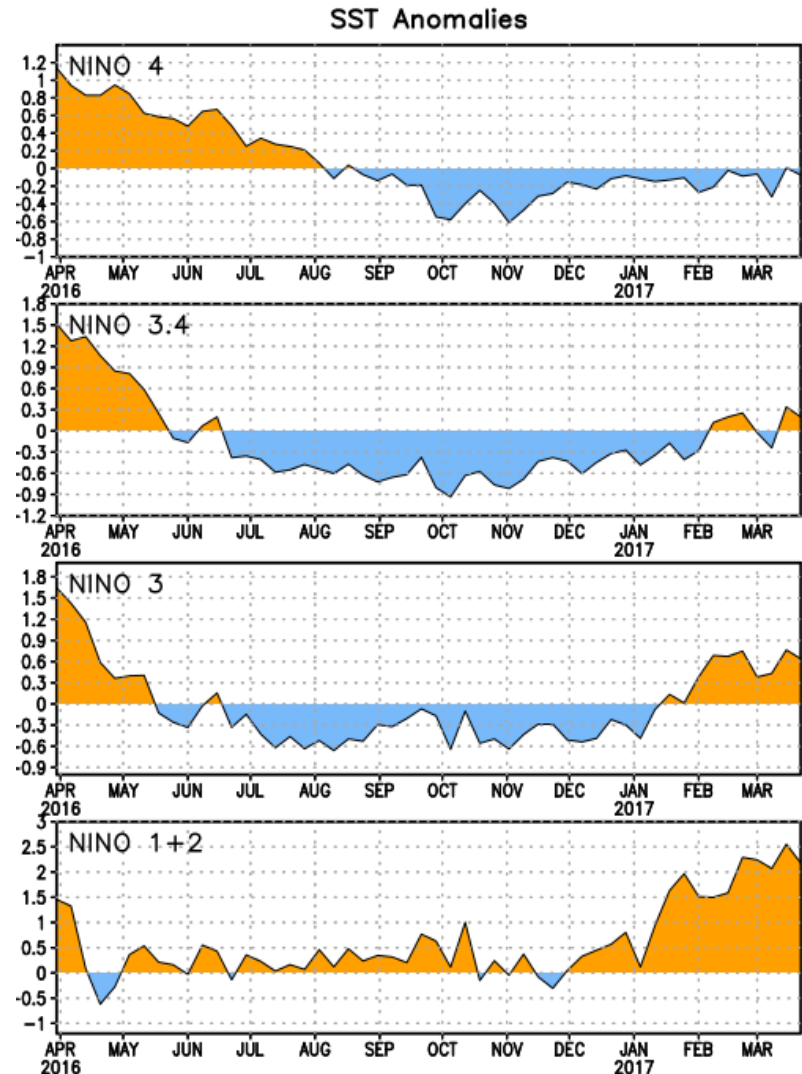
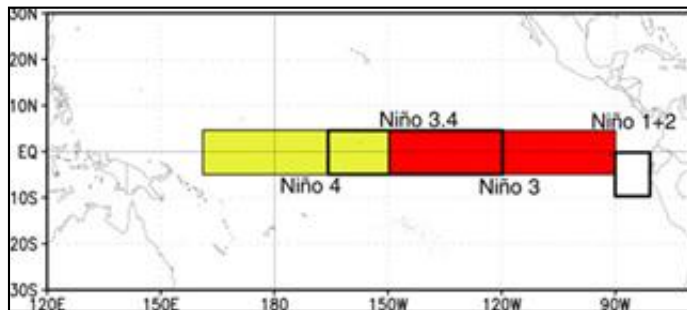
Recently, near-average SSTs remain in the central and east-central Pacific Ocean, and above-average SSTs persist in the eastern Pacific.



Niño Region SST Departures (°C) Recent Evolution

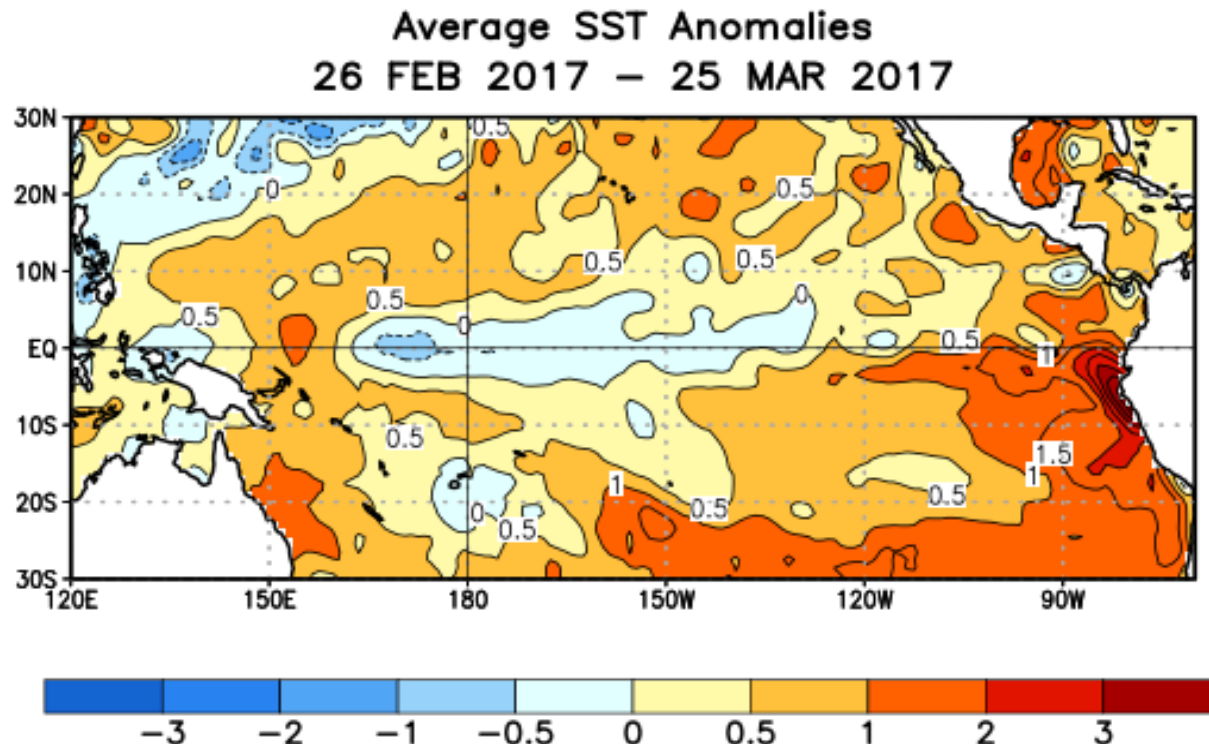
The latest weekly SST departures are:

Niño 4	-0.1°C
Niño 3.4	0.2°C
Niño 3	0.6°C
Niño 1+2	2.2°C



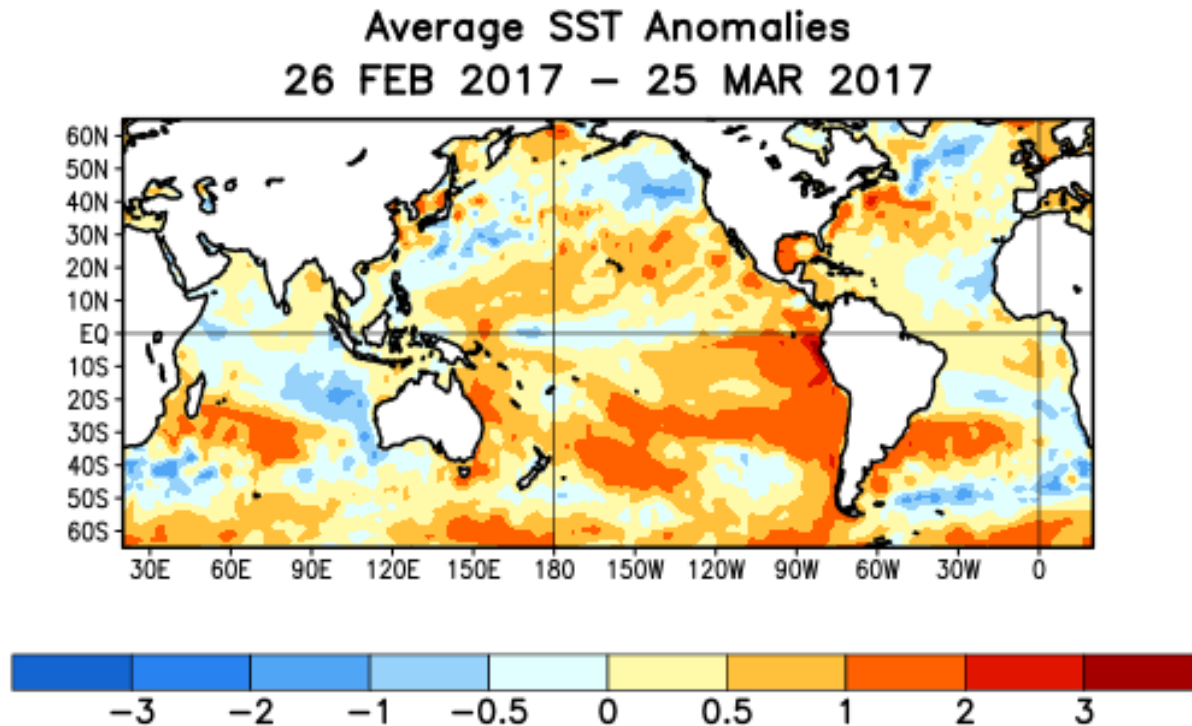
SST Departures ($^{\circ}\text{C}$) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were near-to-below average across the central Pacific Ocean, and above-average across the eastern Pacific.



Global SST Departures (°C) During the Last Four Weeks

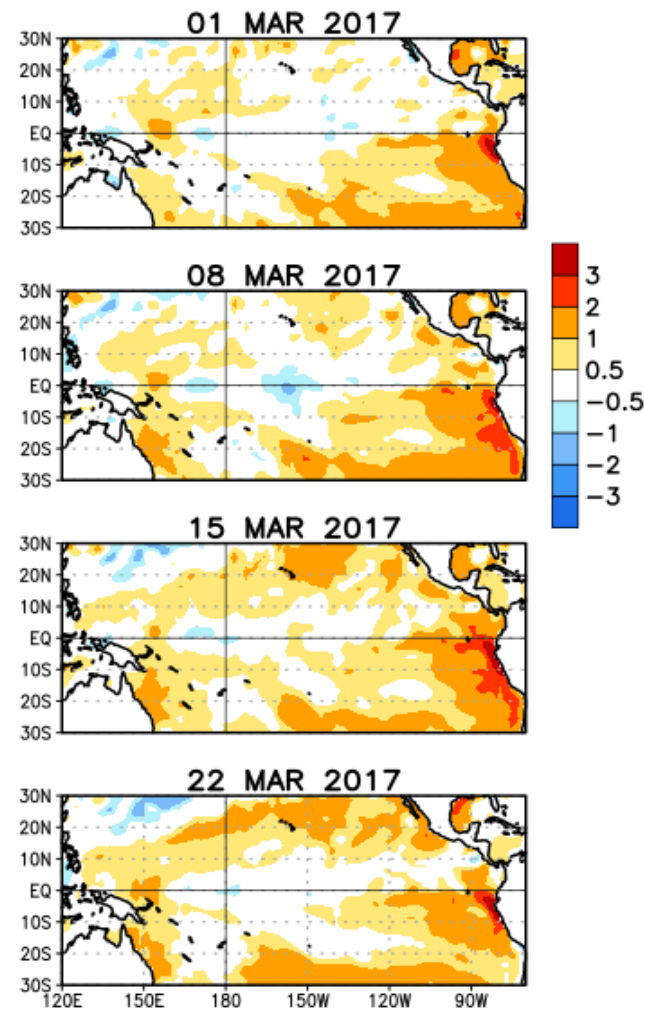
During the last four weeks, equatorial SSTs were above average in the eastern Pacific. Equatorial SSTs were near-to-below average across the western and eastern Indian Ocean and the central Pacific Ocean.



Weekly SST Departures during the Last Four Weeks

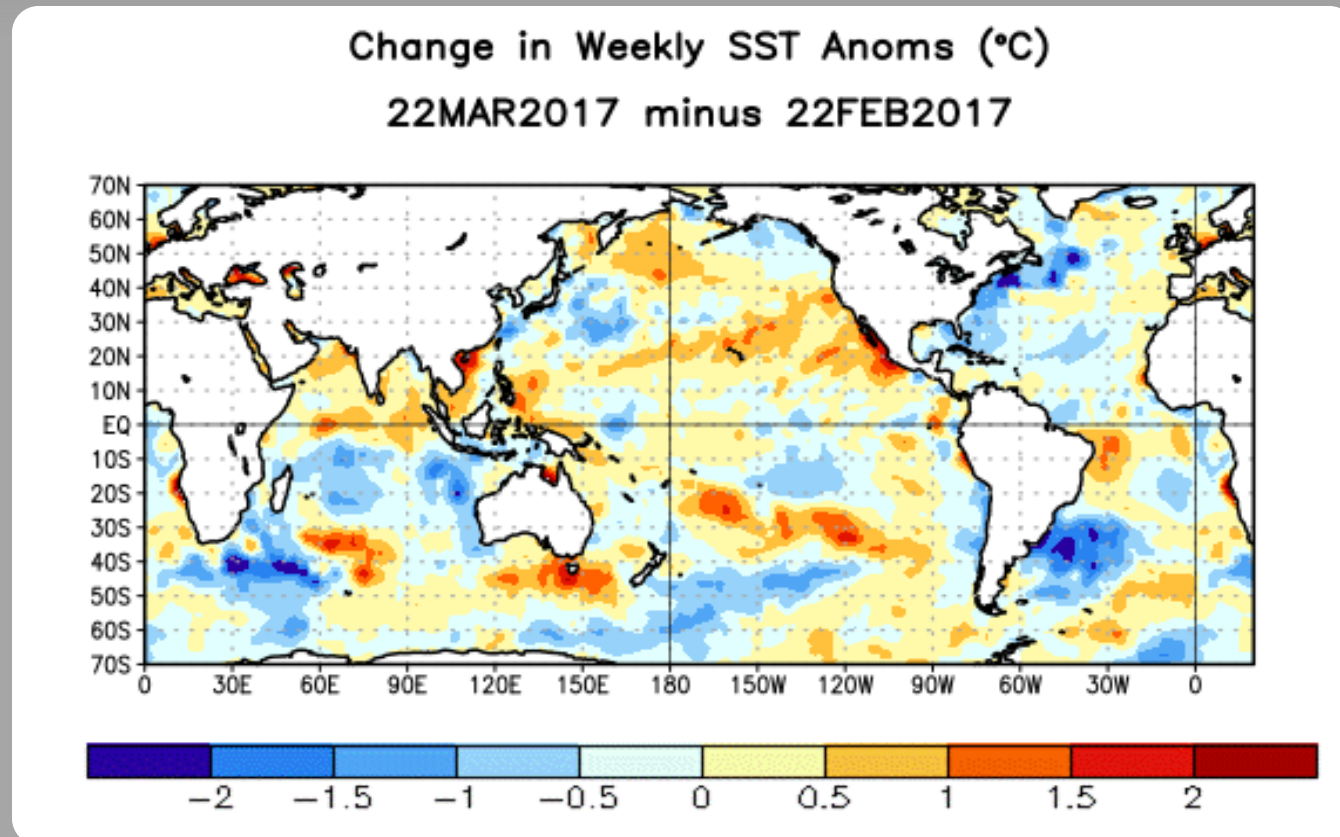
During the last four weeks, near-average to below-average SSTs continued in the central Pacific and above-average SSTs persisted in the eastern Pacific.

Weekly SST Anomalies (DEG C)



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, negative changes in equatorial SST anomalies were evident in the east-central and western Pacific Ocean.



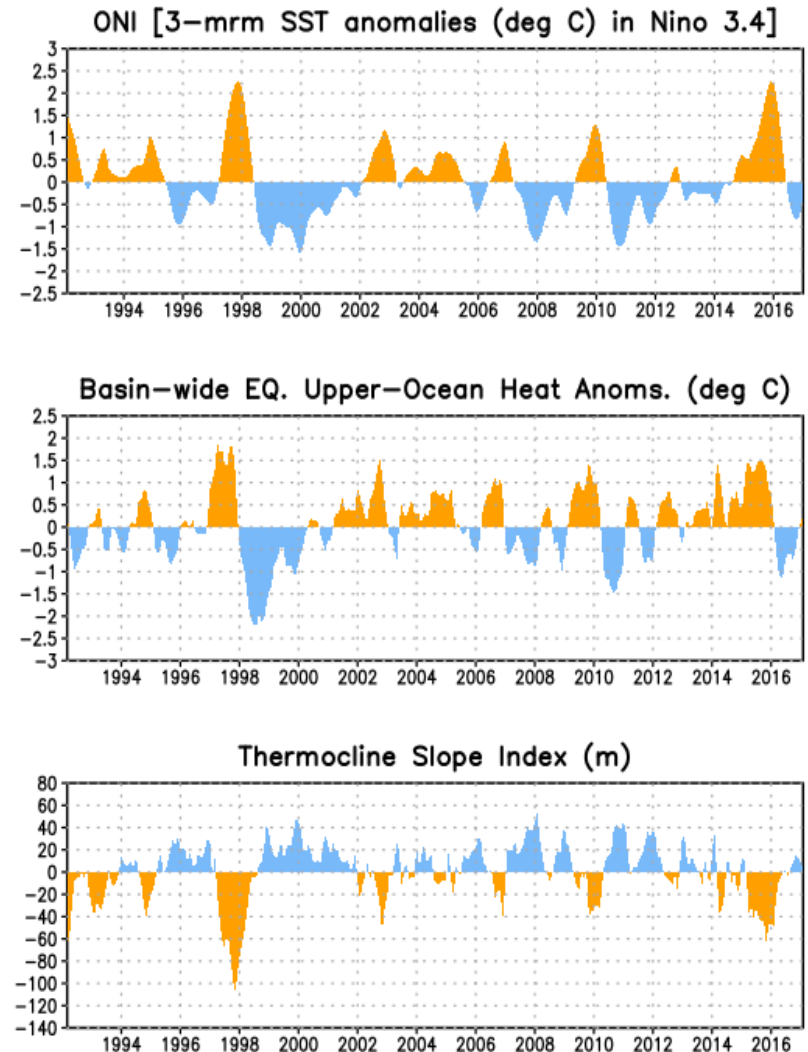
Upper-Ocean Conditions in the Equatorial Pacific

The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

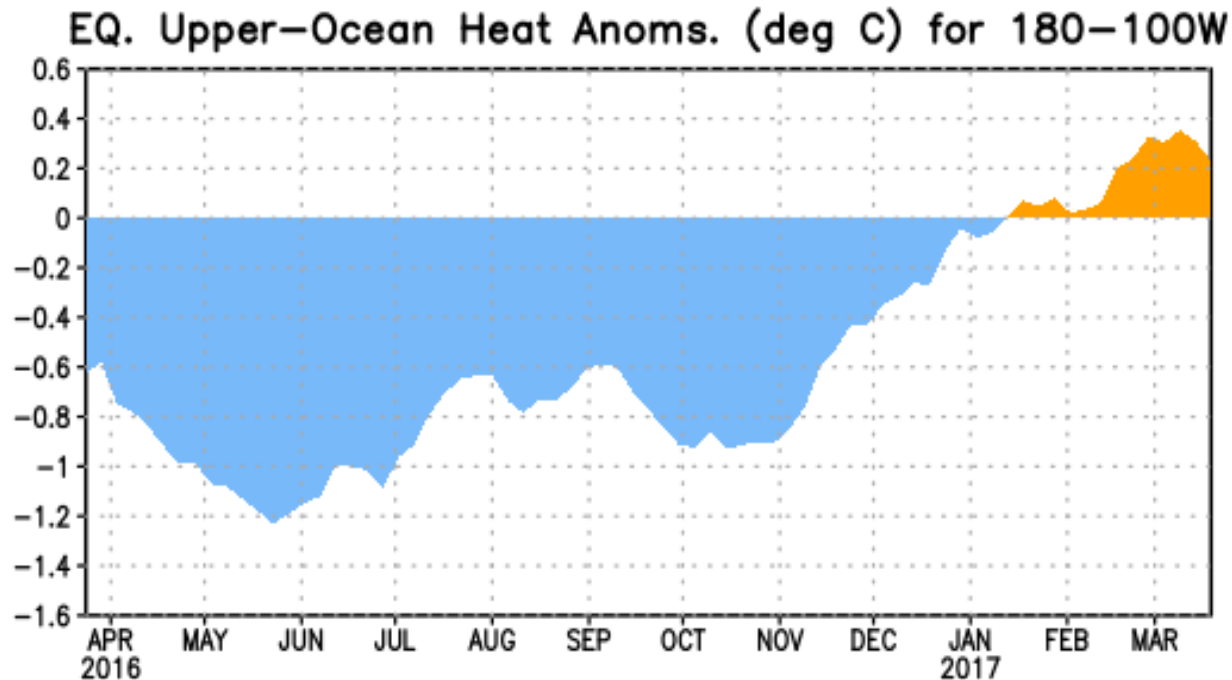
Recent values of the upper-ocean heat anomalies (near average) and thermocline slope index (slightly positive) reflect ENSO-neutral conditions.

The monthly thermocline slope index represents the difference in anomalous depth of the 20°C isotherm between the western Pacific (160°E-150°W) and the eastern Pacific (90°-140°W).



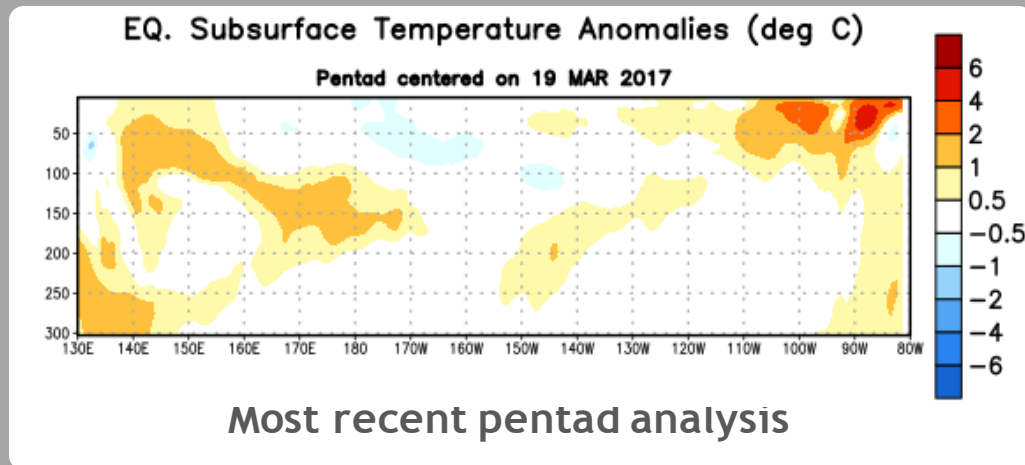
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies were present from March 2016 through December 2016. Since mid-January 2017, anomalies have been positive.

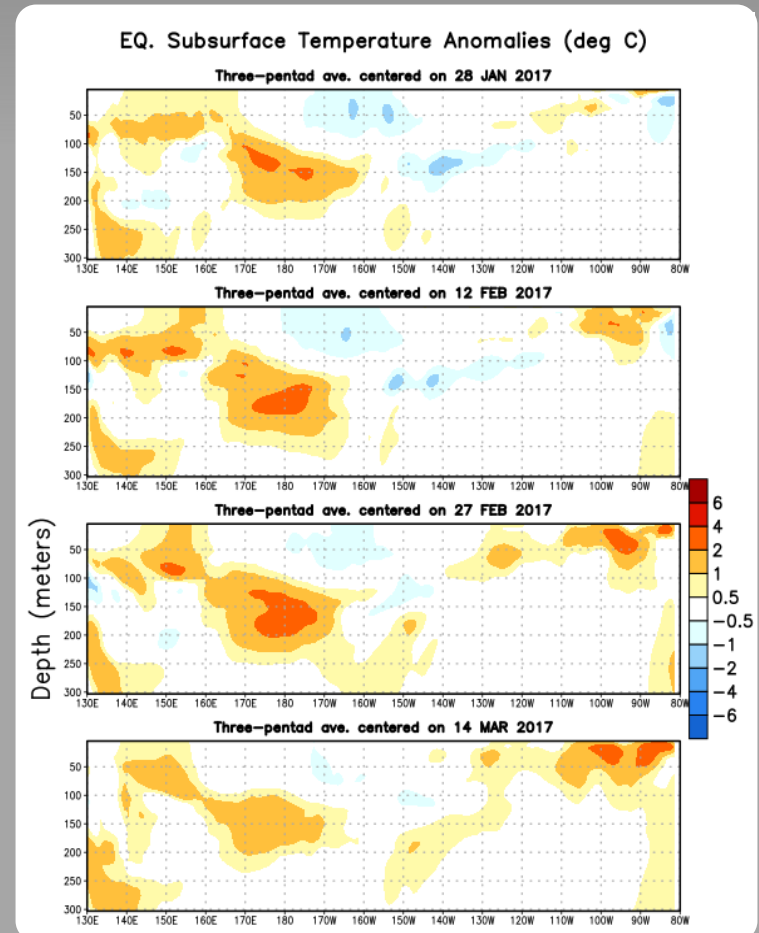


Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies grew across the equatorial Pacific Ocean.



Recently, positive subsurface temperature anomalies have increased in the eastern equatorial Pacific Ocean.

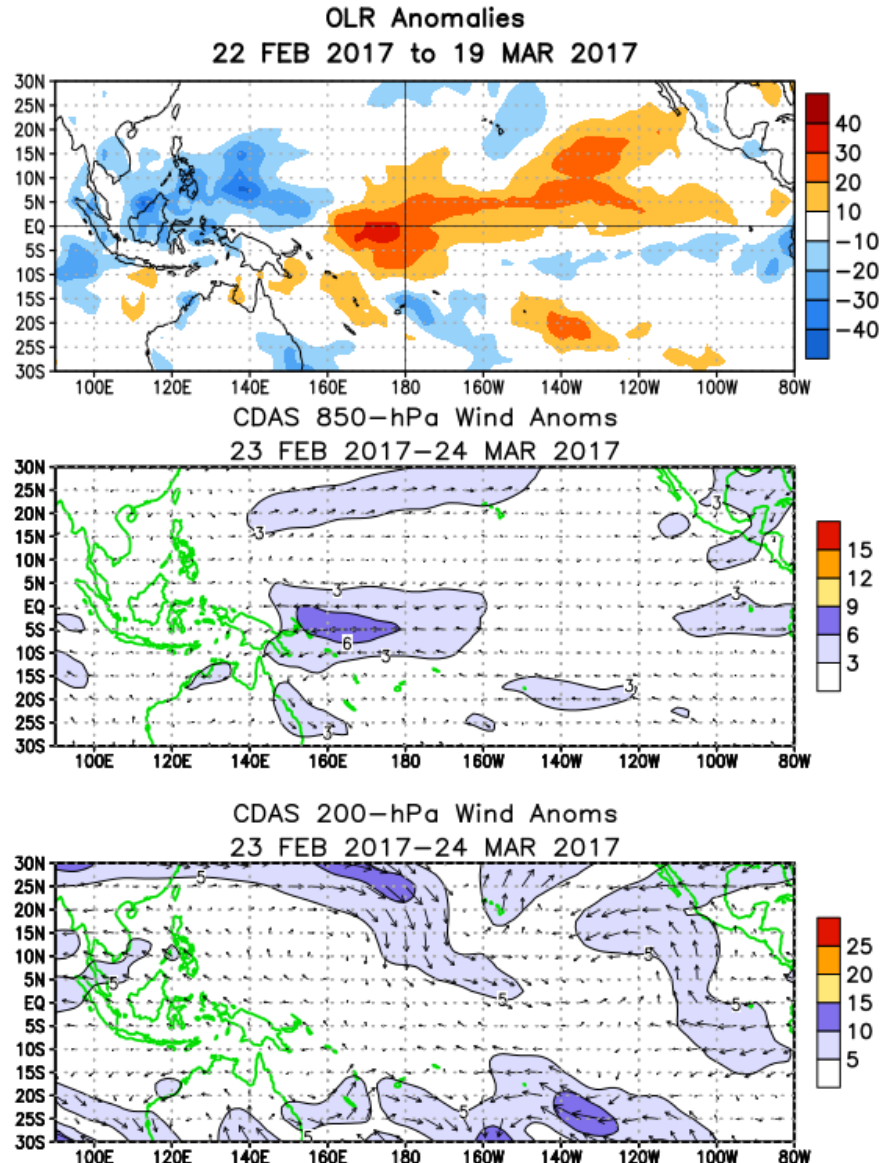


Tropical OLR and Wind Anomalies During the Last 30 Days

Negative OLR anomalies (enhanced convection and precipitation) were evident over the Philippines, Southeast Asia, and in the eastern Pacific south of the equator. Positive OLR anomalies (suppressed convection and precipitation) were observed around the International Date Line and north of the equator in the central to eastern Pacific.

Low-level (850-hPa) anomalous westerlies were evident over the eastern tropical Pacific Ocean, while anomalous easterlies were observed near and west of the Date Line.

Upper-level (200-hPa) anomalous easterlies were evident over the eastern Pacific Ocean, while anomalous westerlies were evident over the east-central Pacific.



Intraseasonal Variability

Intraseasonal variability in the atmosphere (wind and pressure), which is often related to the Madden-Julian Oscillation (MJO), can significantly impact surface and subsurface conditions across the Pacific Ocean.

Related to this activity:

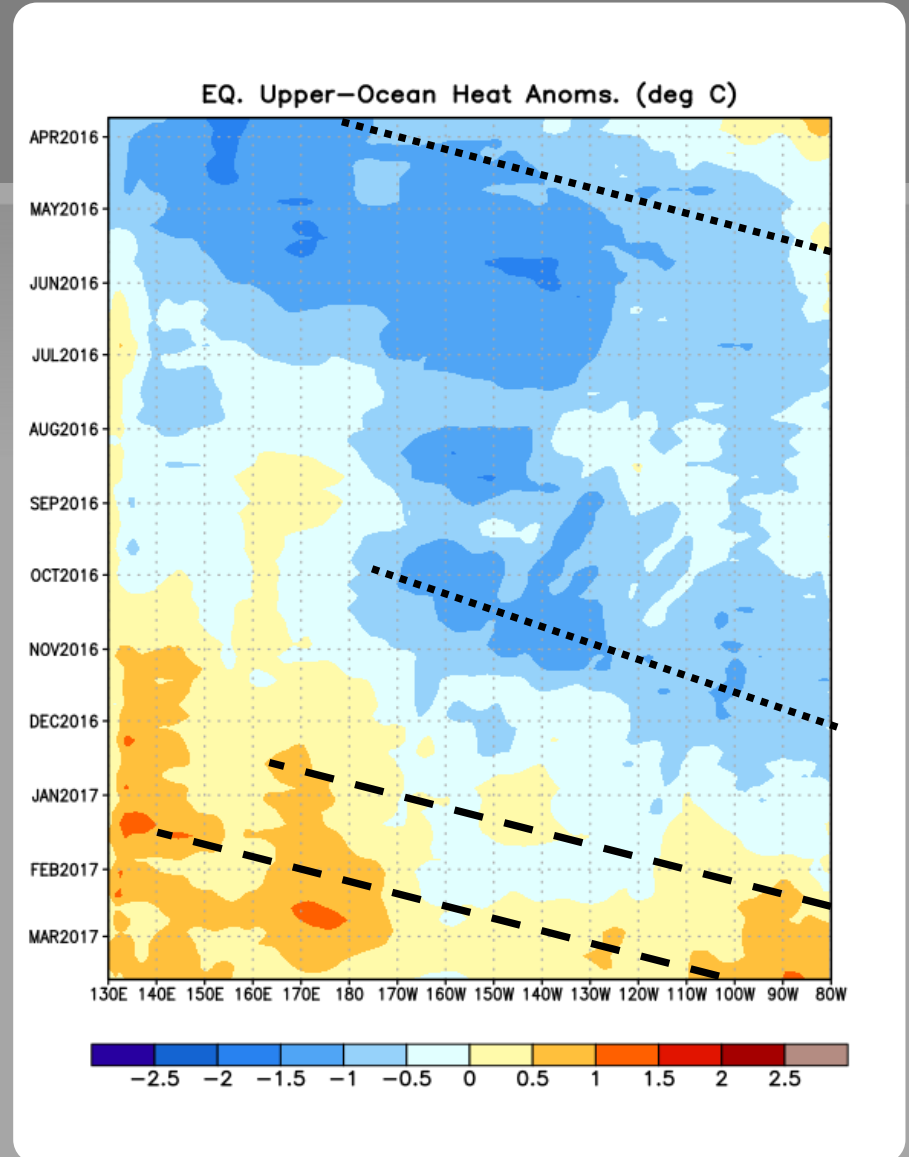
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

Weekly Heat Content Evolution in the Equatorial Pacific

With the passage of an upwelling equatorial oceanic Kelvin wave in March 2016, below-average subsurface temperatures extended across much of the equatorial Pacific.

Since December 2016, positive subsurface temperature anomalies have expanded into the eastern Pacific Ocean.

Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.



Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})

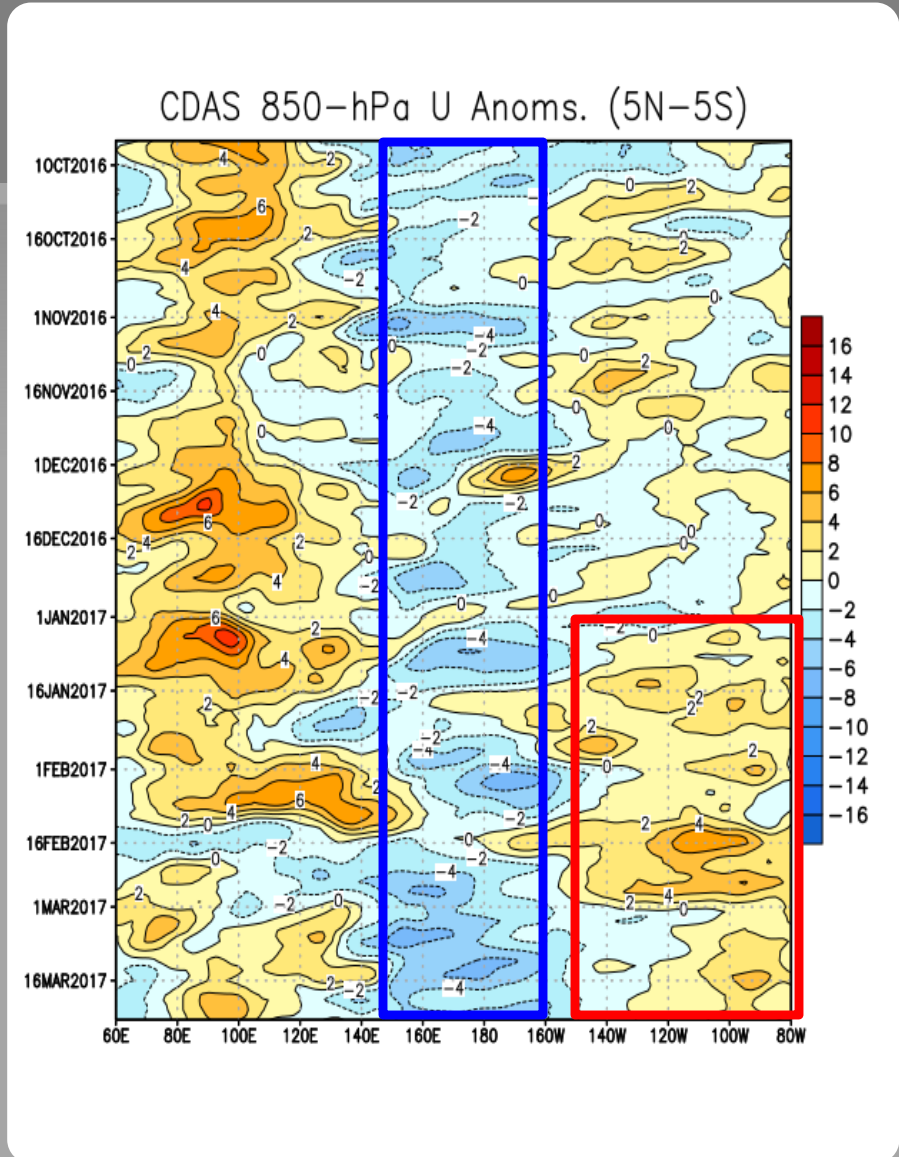
Since mid September 2016, low-level easterly wind anomalies generally persisted over the central and western equatorial Pacific.

Since January 2017, westerly wind anomalies were observed over the eastern Pacific Ocean.

Over the last week, the low-level easterly wind anomalies strengthened over the central equatorial Pacific, while the westerly anomalies persisted over the far eastern Pacific.

Westerly Wind Anomalies (orange/red shading)

Easterly Wind Anomalies (blue shading)



Upper-level (200-hPa) Velocity Potential Anomalies

Eastward propagation of regions of upper-level divergence (green shading) and convergence (brown shading) are particularly evident during November 2016, and January-February 2017.

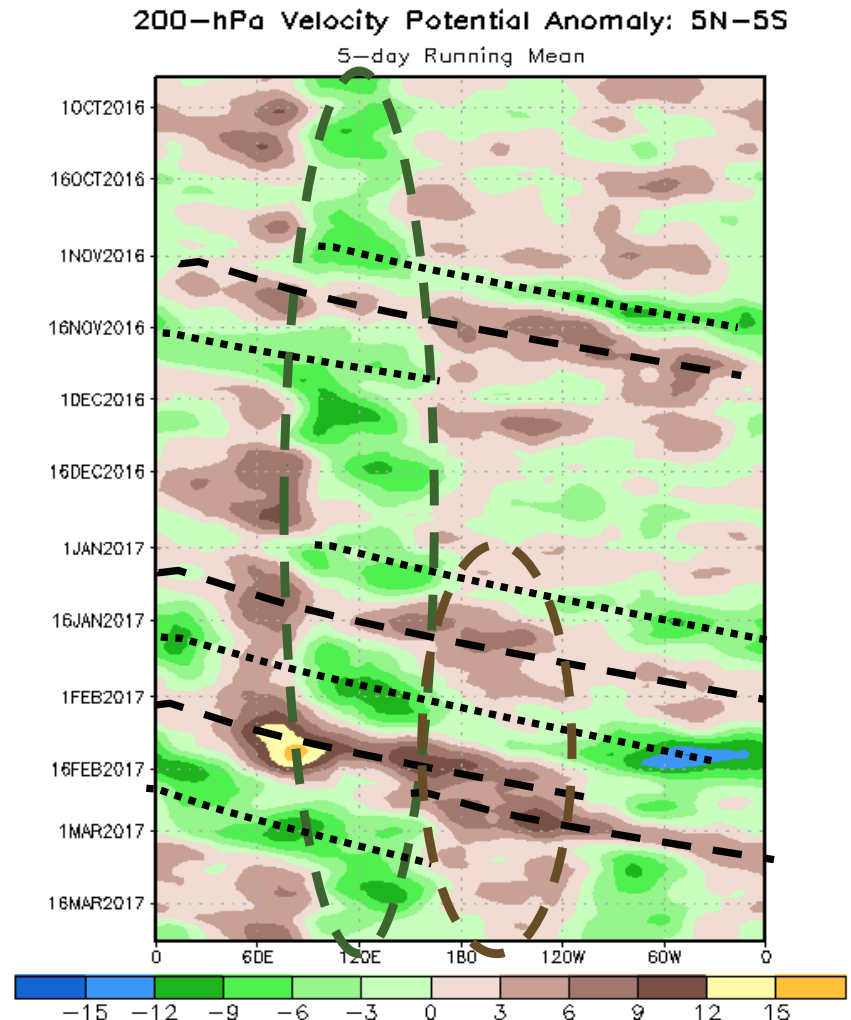
From September 2016 to present, anomalous upper-level divergence has generally persisted near Indonesia.

Since January 2017, anomalous upper-level convergence has mostly continued across the central and east-central equatorial Pacific.

Unfavorable for precipitation (brown shading)

Favorable for precipitation (green shading)

Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).

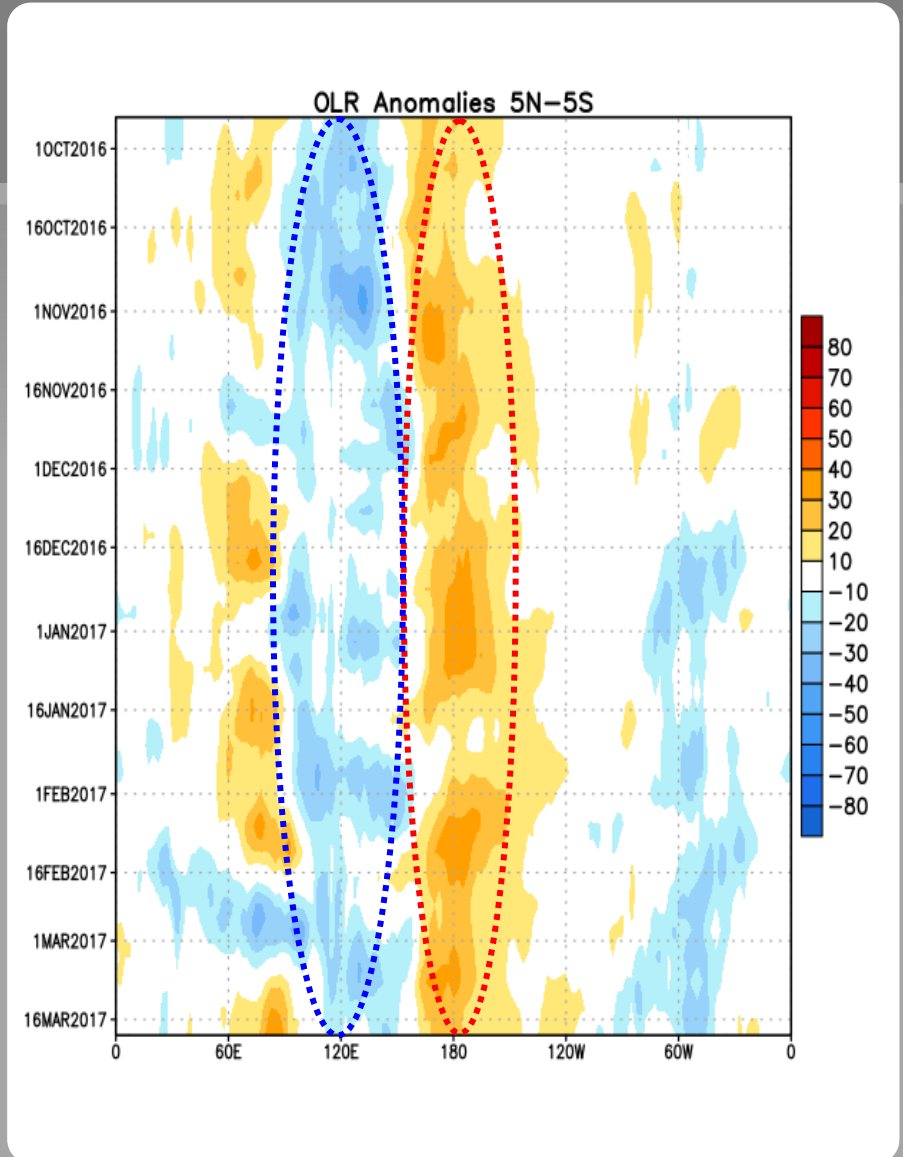


Outgoing Longwave Radiation (OLR) Anomalies

Since early August 2016, positive OLR anomalies have persisted near the International Date Line.

Since early September 2016, negative OLR anomalies have generally persisted near the Maritime Continent/far western Pacific Ocean.

Drier-than-average Conditions (orange/red shading)
Wetter-than-average Conditions (blue shading)



Oceanic Niño Index (ONI)

The ONI is based on SST departures from average in the Niño 3.4 region, and is a principal measure for monitoring, assessing, and predicting ENSO.

Defined as the three-month running-mean SST departures in the Niño 3.4 region. Departures are based on a set of improved homogeneous historical SST analyses (Extended Reconstructed SST - ERSST.v4). The SST reconstruction methodology is described in Huang et al., 2015, J. Climate, vol. 28, 911-930.)

It is one index that helps to place current events into a historical perspective

NOAA Operational Definitions for El Niño and La Niña

El Niño: characterized by a positive ONI greater than or equal to $+0.5^{\circ}\text{C}$.

La Niña: characterized by a negative ONI less than or equal to -0.5°C .

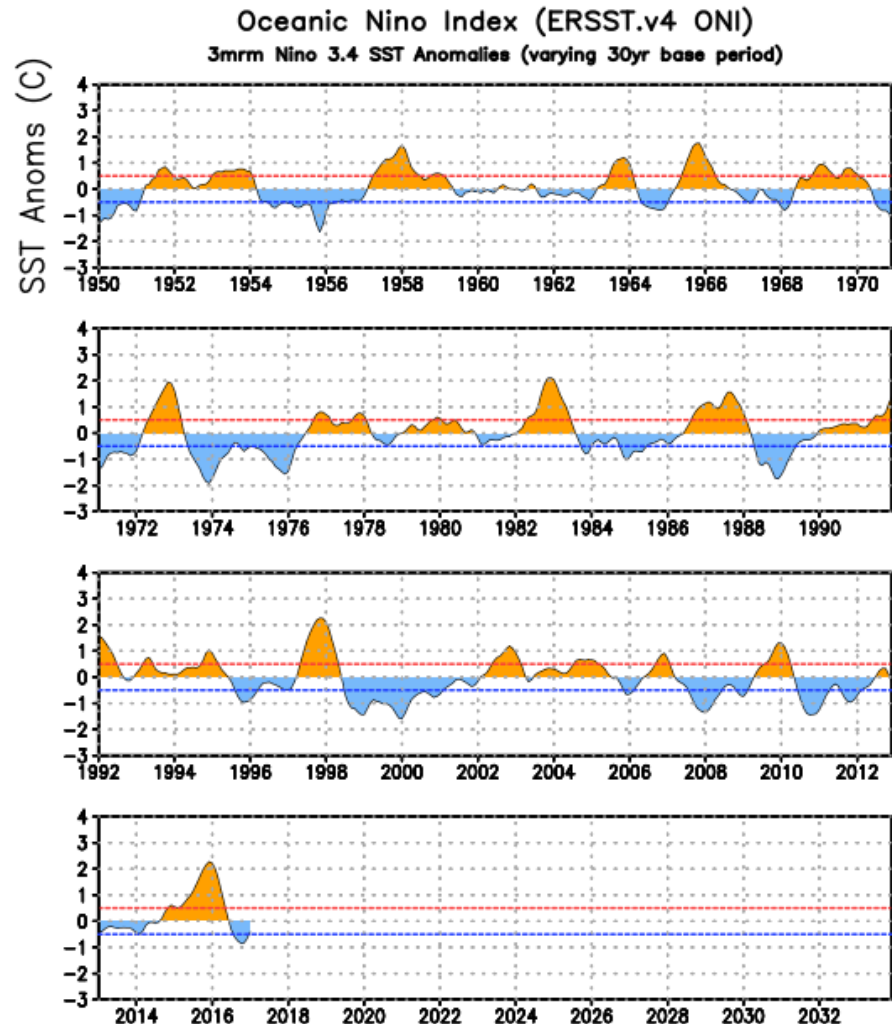
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed $\pm 0.5^{\circ}\text{C}$ along with consistent atmospheric features. These anomalies must also be forecasted to persist for 3 consecutive months.

ONI (°C): Evolution since 1950

The most recent ONI value (December 2016 - February 2017) is -0.4°C .

El Niño ↑
Neutral
La Niña ↓



Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v4

Recent Pacific warm (red) and cold (blue) periods based on a threshold of $\pm 0.5^{\circ}\text{C}$ for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v4 SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes, periods of below and above normal SSTs are colored in blue and red when the threshold is met for a minimum of 5 consecutive over-lapping seasons.

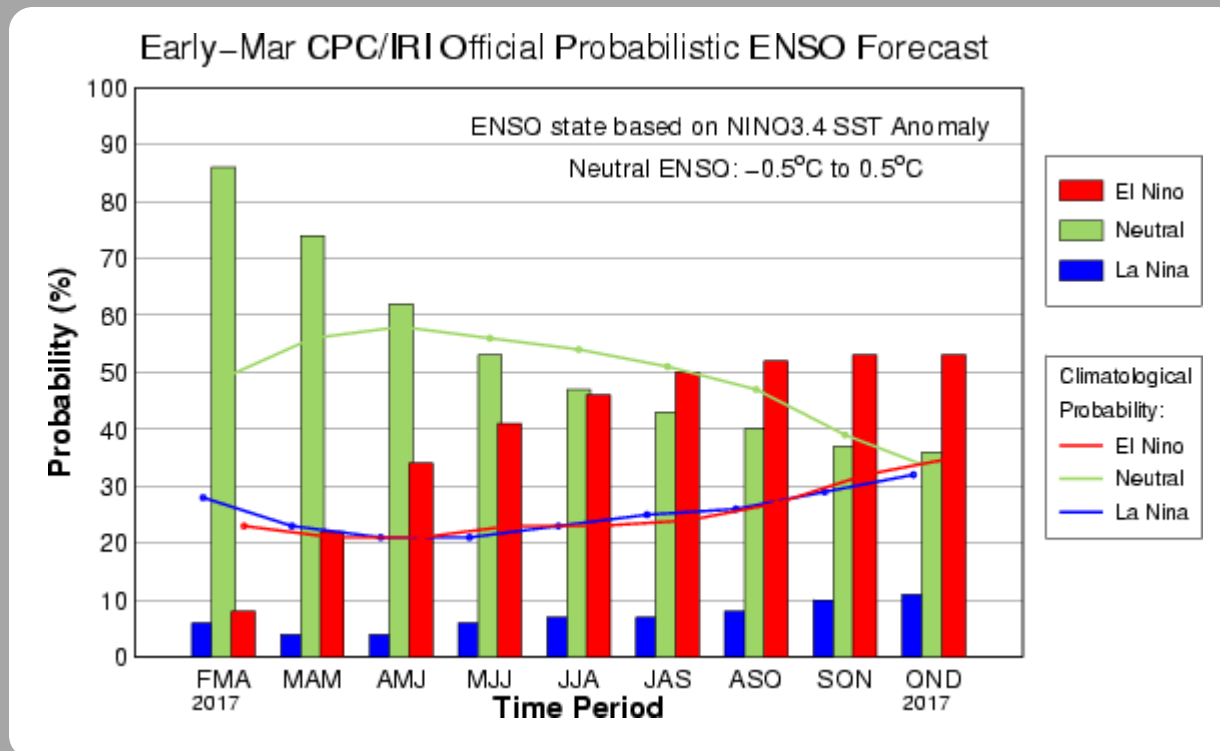
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found [here](#).

[illegible]

CPC/IRI Probabilistic ENSO Outlook

Updated: 9 March 2017

ENSO-neutral is favored through mid-2017, with a slight tilt toward El Niño (~50%) during the late summer through fall 2017.



IRI/CPC Pacific Niño

3.4 SST Model Outlook

Most dynamical models favor El Niño during the early Northern Hemisphere summer 2017, while statistical models favor ENSO-neutral through the Northern Hemisphere autumn 2017.

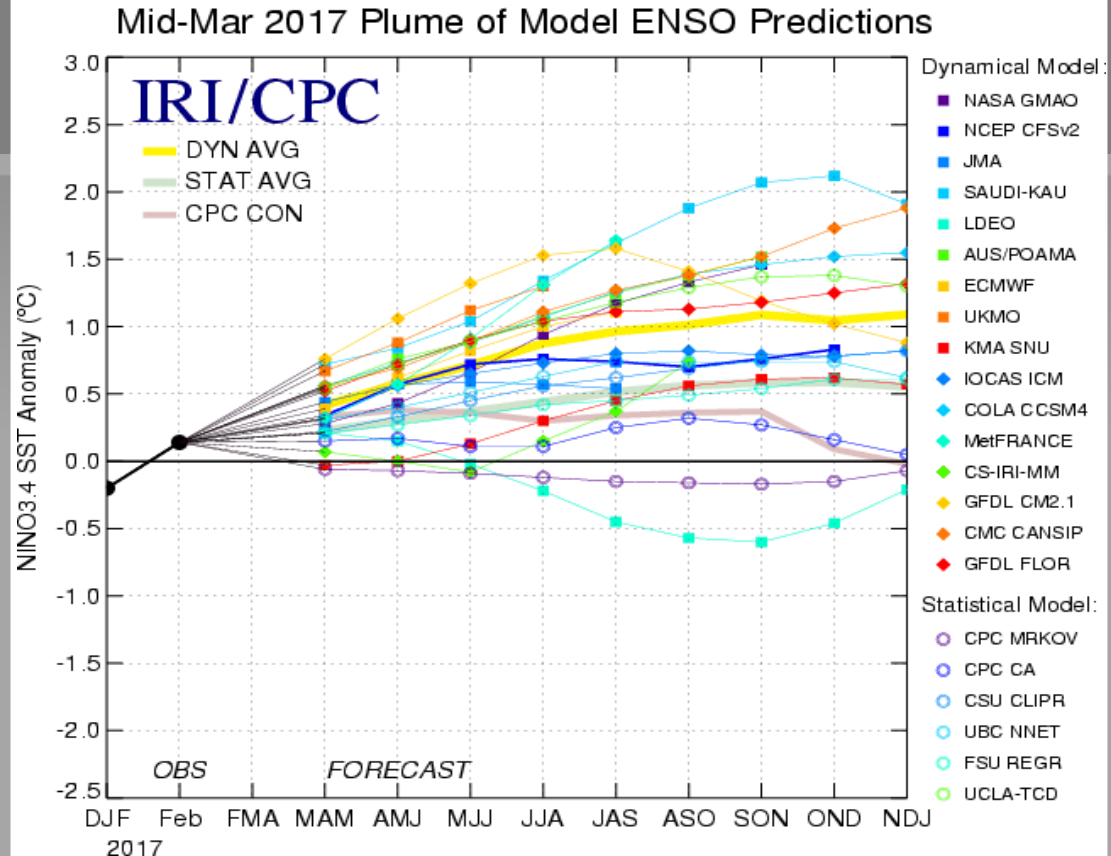


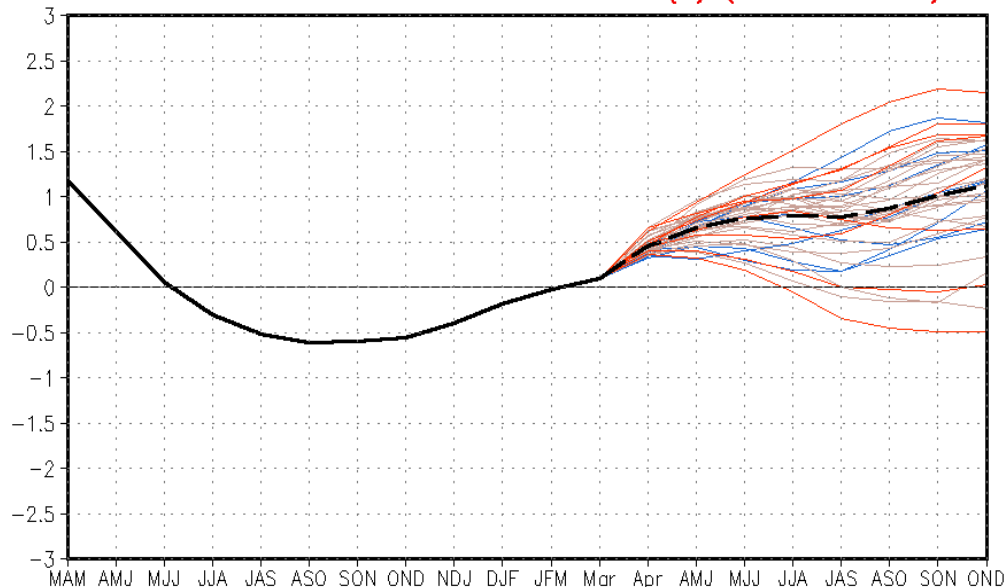
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 15 March 2017).

SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

Issued: 27 March 2017

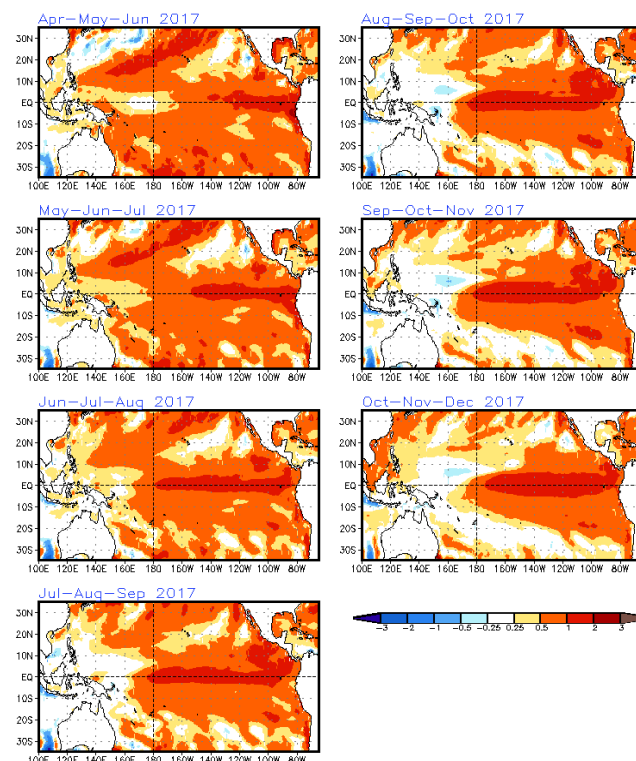
The CFS.v2 ensemble mean (black dashed line) favors weak El Niño conditions to develop during the Northern Hemisphere spring 2017, strengthening into the autumn of 2017.

CFSv2 forecast Nino3.4 SST anomalies (K) (PDF corrected)



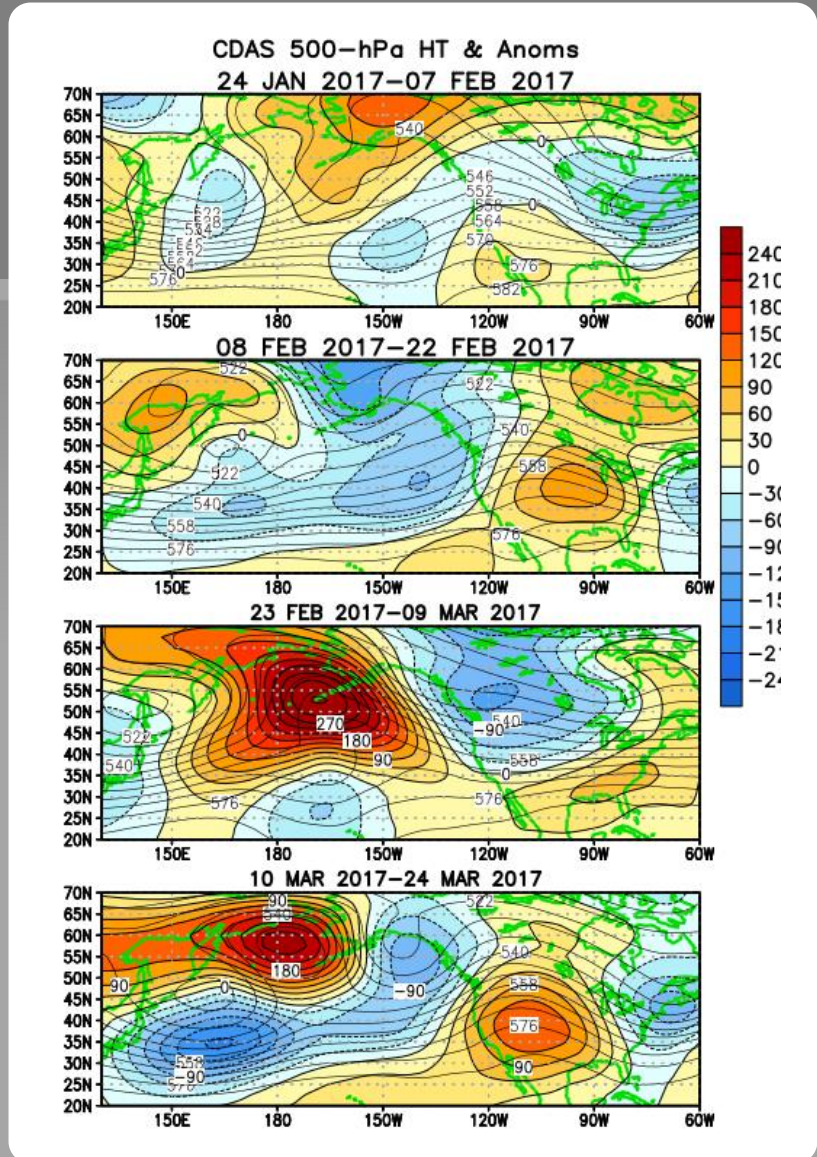
— Latest 8 forecast members
— Earliest 8 forecast members
— Other forecast members
— Forecast ensemble mean
— NCDC daily analysis

(Model bias correct base period: 1999–2010; Climatology base period: 1982–2010)



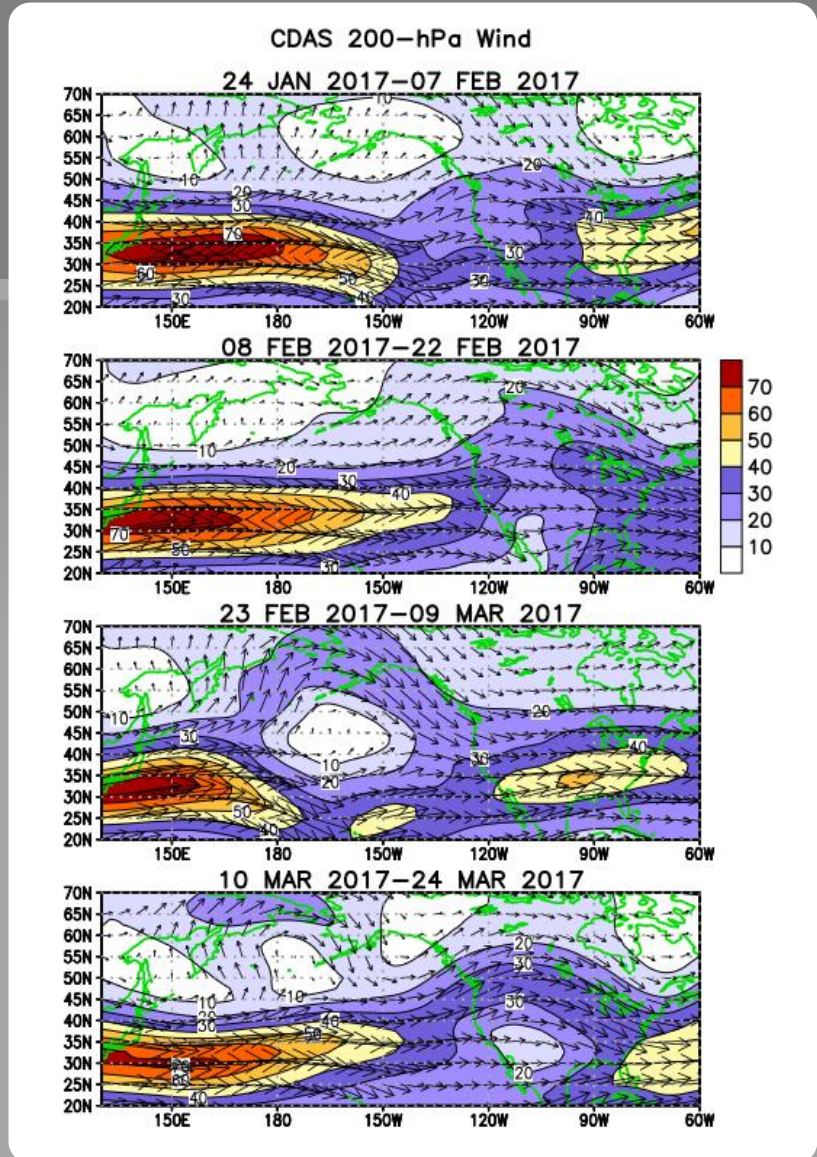
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

Since late January 2017, below-average heights and temperatures have prevailed over the eastern North Pacific Ocean or northwestern United States/western Canada, while heights and temperatures have varied over the eastern U.S.



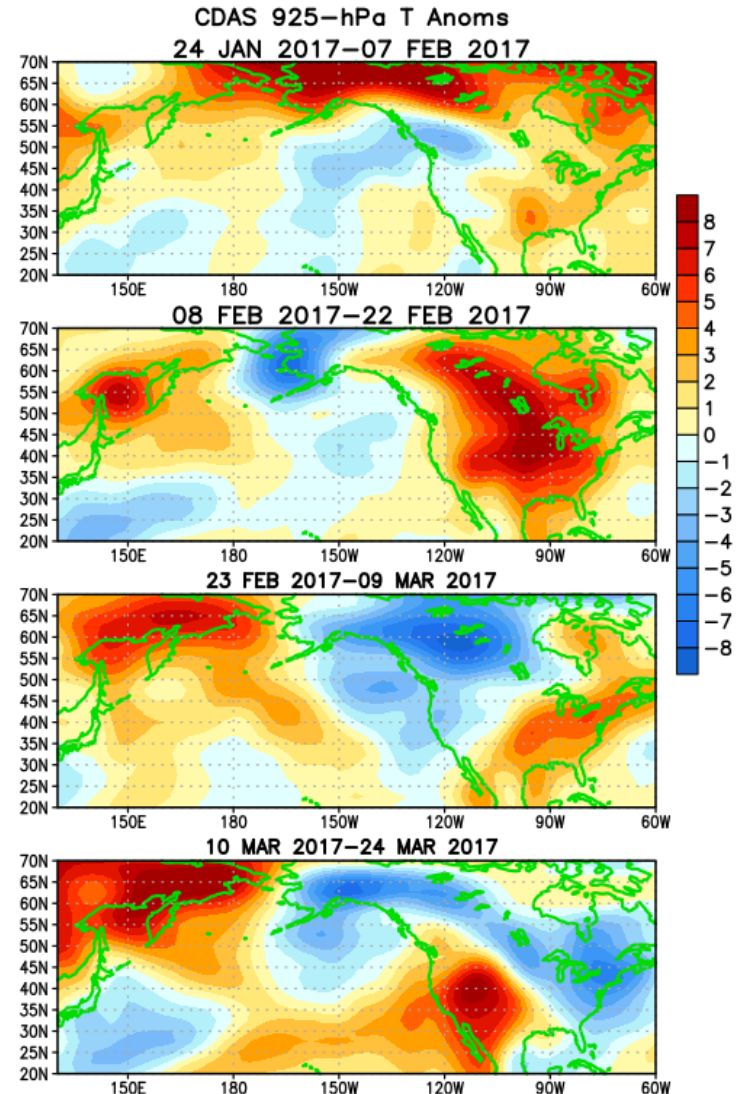
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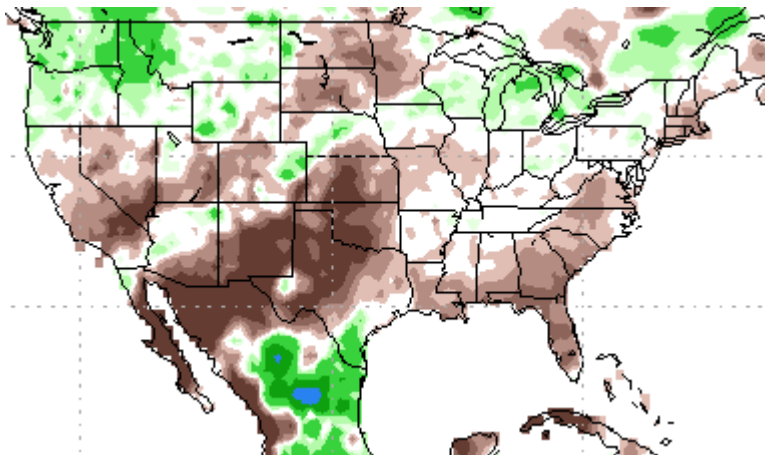
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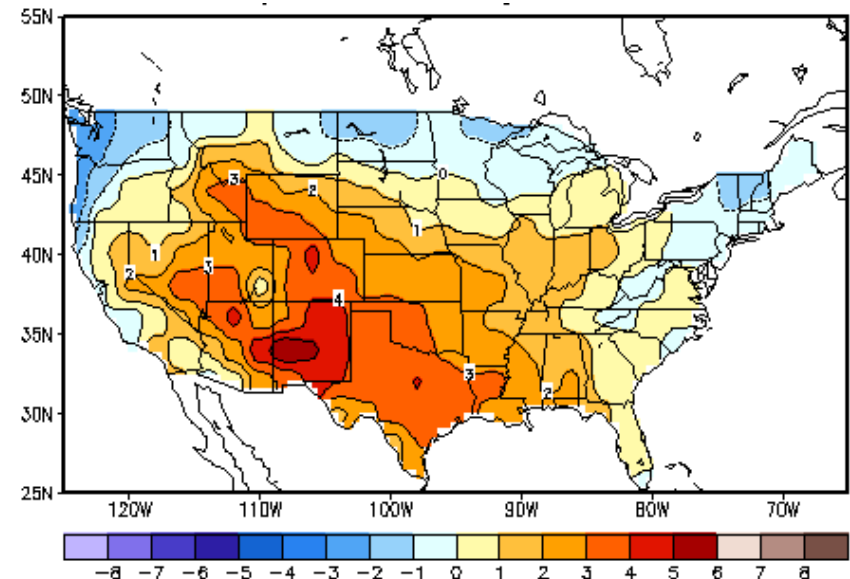
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 25 March 2017

Percent of Average Precipitation



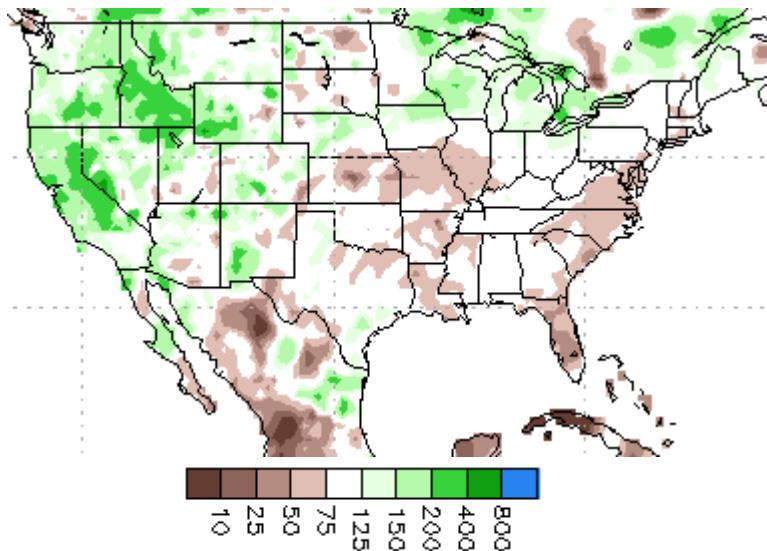
Temperature Departures (degree C)



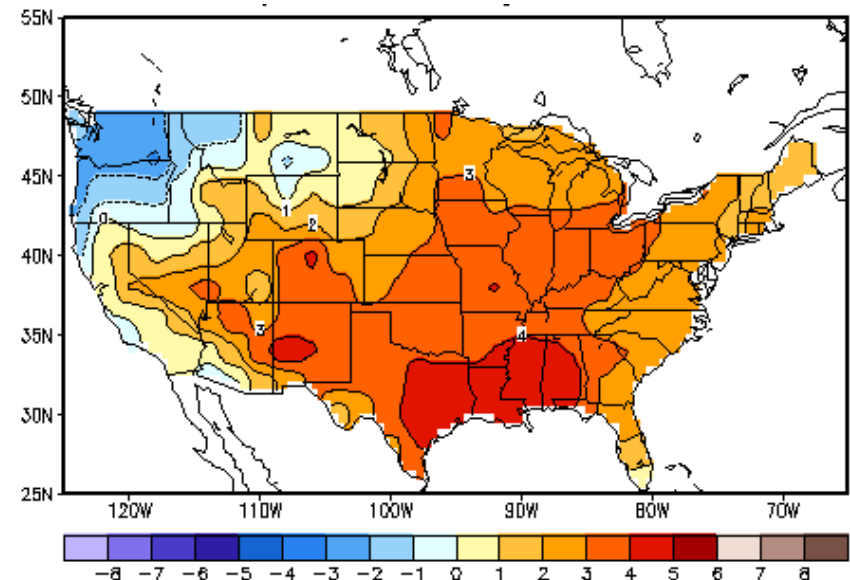
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 25 March 2017

Percent of Average Precipitation



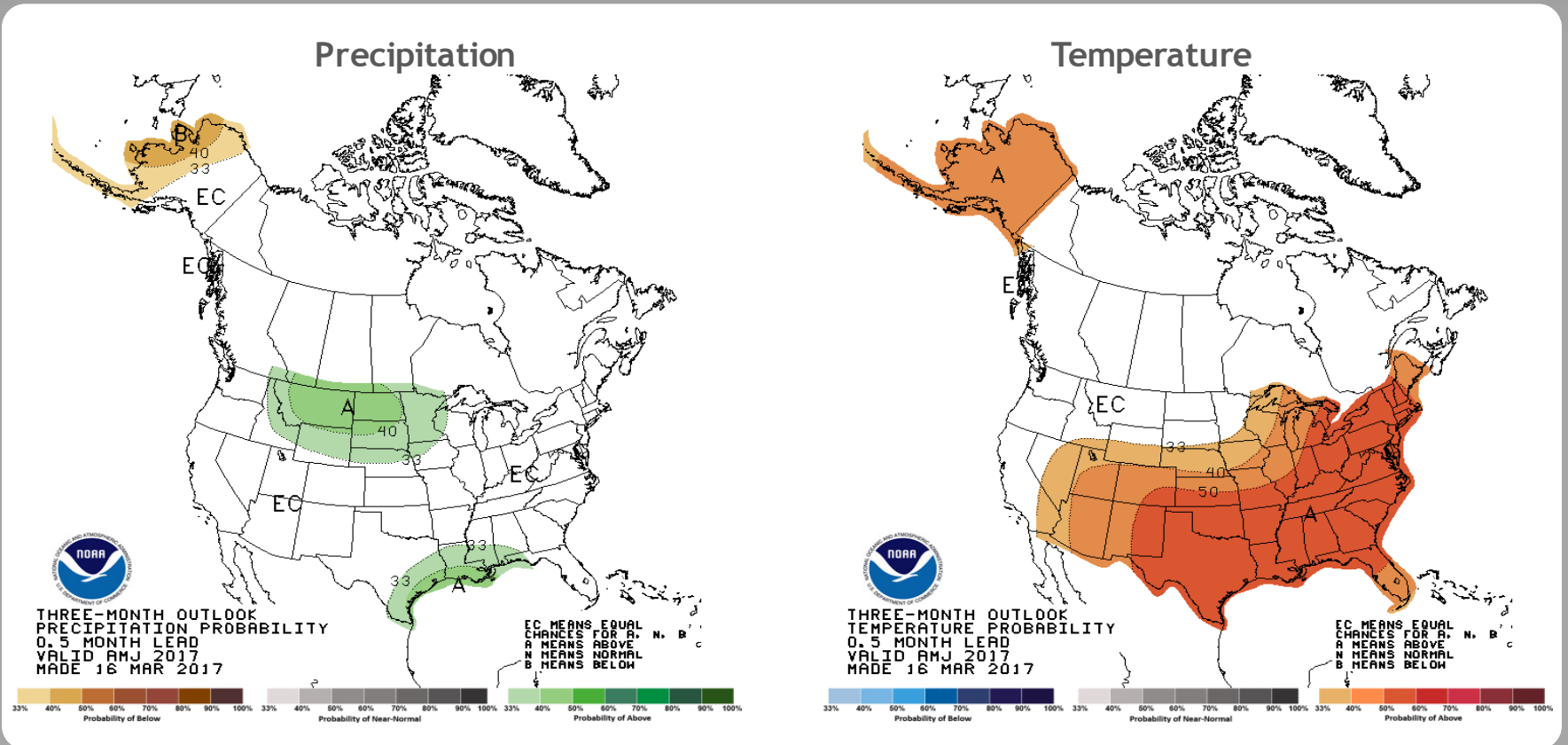
Temperature Departures (degree C)



U. S. Seasonal Outlooks

April - June 2017

The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.



Summary

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